LESSON 3: NUTRITION — NOURISHING YOUR BODY

amino acids
cholesterol
complex carbohydrates
fat soluble
vitamins
metabolic
mono-unsaturated fats
poly-unsaturated fats
proteins
referenced daily intake (RDI)
saturated fats
simple carbohydrates
water soluble vitamins

INTRODUCTION

Nutrition is the science of nourishing the body properly in order to reach the higher levels of dynamic living. This lesson will introduce you to the six nutrients and show you how to best provide them in a diet that is well rounded yet diversified. You will learn the newest methods available in how to choose your foods and how to read labels. Finally, you will better understand how to maintain a lean body, free from the damaging effects of carrying too much personal fat.

Our diets have radically changed during the past 35 years. With the advent of fast-food outlets, an increase in dual-career parents, and sky-rocketing numbers of single-parent households, most Americans now have a hurry-up lifestyle where proper eating habits take a back seat to convenience and lack of time.

Knowing that our lifestyle is that way, it is very important that young adults have at least a basic understanding of **nutrients**, how to obtain them, and how to control fat. This knowledge will lead to a more dynamic life and a higher quality lifestyle. The six types of nutrients are **carbohydrates**, fats, proteins, vitamins, minerals, and water.

We also refer to the first three nutrients, carbohydrates, fats, and proteins, as foodstuffs. They give us the energy for all of the bodily processes. When our body uses the foodstuffs, it releases energy. We measure this energy in calories, an amount of energy it takes to raise the temperature of one kilogram of water one degree Celsius. We measure calories in the human body with a calorimeter.

THE NUTRIENT: CARBOHYDRATES

Carbohydrates are the starches and sugars found in fruits, grains, and vegetables. They have a caloric value of four calories per gram and supply us with short- and long-term energy to accomplish everything from thinking and breathing to running a race.

The short-term carbohydrates are the sugars, or **simple carbohydrates**, which are quickly digested and absorbed into the blood. The most important simple sugar is glucose, or blood sugar. Before the body's cells can use other simple sugars (like fructose, sucrose, and lactose) for energy, a change must occur converting them into glucose. Many sugary foods are sources of simple carbohydrates; however, those like soda and candy have few other nutrients, while fruit is an excellent source of simple carbohydrates and contains many other vitamins and minerals as well.

The long-term carbohydrates are starches, or complex carbohydrates, which are made up of combinations of simple sugars. They take longer to digest because the body must break them into simple sugars (glucose) before they can enter the bloodstream. When your body has extra glucose that it does not

need right away for energy, it converts it into the complex carbohydrate glycogen and stores it in the muscles and liver to be released later when energy is needed, usually for short periods of strenuous activity. Once your muscles and liver store as much glycogen as they can hold, your body changes the rest to body fat for long-term energy. Long distance runners will use carbohydrate loading (eating large quantities of carbohydrates) in order to have the long-term energy they need to complete the race.

Good sources of complex carbohydrates are grains (such as bread, cereal, pasta, and rice) and starchy vegetables (such as peas, corn, beans, and potatoes). These starchy foods are also important sources of vitamins, minerals, and fiber. Fiber provides no calories but is roughage that aids in the movement of food through the digestive system.

NOURISHING YOUR BODY'S FUEL WITH FATS

Fats, or lipids, perform the vital roles of maintaining body temperature, insulating body organs, providing the body with stored energy, and carrying the fat soluble vitamins A, D, E, and K to the cells. One gram of fat is the equivalent of nine calories of energy, more than twice the amount of carbohydrates. Therefore, minimum consumption of fats is the most sensible approach to maintaining a lean body fat content.

Triglycerides are the primary fats in the foods we eat, as well as the fats stored in body tissue. They include **saturated fat**, which mainly comes from animal sources and does not melt at room temperature, and **mono-unsaturated** and **poly-unsaturated fats**, which are usually liquid oils of vegetable origin. When you eat too many calories, your liver changes them into triglycerides and stores them as fat. When you eat too many saturated fats, your liver makes more **cholesterol** than your body needs, which is unhealthy.

Your liver already produces about 1000 milligrams (mg) of cholesterol daily and diet adds another 400 to 500 mg. Cholesterol, a waxy, sticky substance found in animal and human tissue, insulates nerves and forms hormones, cell membranes, vitamin D, and bile to aid in food digestion.

Your blood carries cholesterol by way of lipoproteins, with low density lipoproteins (LDL) carrying cholesterol from the liver to the cells to accomplish the functions mentioned. Unfortunately, the LDLs deposit any cholesterol that is not needed by the cells in the arteries, giving them the nickname of the "bad guys." Cholesterol accumulated on the inside walls of the arteries is a factor in the development of atherosclerosis. Eventually, cardiovascular disease, in the form of a heart attack or stroke, may result.

DID YOU KNOW?

Cardiovascular disease is the main killer of American people.

The high density lipoproteins (HDL) carry the extra cholesterol in your blood to the liver to dispose of it, thus preventing cholesterol from building up in the arteries. For this reason, HDLs are known as the "good guys." To keep cholesterol at a normal level in the body, you must lower LDL levels and raise HDL levels. Steps you can take to accomplish this are to eat less fat, especially saturated fat, maintain appropriate body weight, and participate in a regular exercise program. Eating more fiber will also help, since it binds with cholesterol and carries it out of the body; and consuming mono-unsaturated fats, like olive, canola, and peanut oils, raises HDLs.

NOURISHING YOUR BODY WITH PROTEINS

The body contains substances called **proteins** in every cell. They aid in the development and maintenance of muscle, bone, skin, and blood. Proteins are also the key behind keeping the immune system strong. They control the chemical activities in the body that transport oxygen, iron, and nutrients to the body cells. The body can also use protein for energy if it is low on carbohydrates and fats; but in most cases, its role as an energy source is minor. Proteins, like carbohydrates, contain four calories per gram.

The building blocks of protein are the amino acids. These chains of carbon, hydrogen, oxygen, and nitrogen linked together in different ways control all of the activities mentioned above. There are 22 amino acids found in the human tissue, but the body cannot manufacture all of them. Eight (nine for children) amino acids, known as the essential amino acids, must come from the food we eat since the body cannot produce them. We refer to the food products that contain all eight essential amino acids as having complete proteins. The best sources of complete proteins are meat, fish, poultry, and dairy products. Plant foods generally contain incomplete proteins since they are either low on or lack an essential amino acid. However, plant foods can be combined easily, such as rice and beans or peanut butter and bread, to include all essential amino acids in high enough amounts to form a complete protein.

The remaining 14 amino acids are known as the nonessential amino acids. They are still necessary for bodily functioning, but are called "nonessential" because they do not have to be supplied in the diet. Instead, the body manufactures nonessential amino acids itself.

Keep in mind that while animal and dairy products are sources of complete proteins, many are often high in fat as well. As you will read later in this text, Americans get most of their protein from animal sources instead of from combinations of complex carbohydrates. You will have a healthier diet and still meet your protein needs if you consume less fatty foods and more carbohydrates in the forms of grains and vegetables.

REGULATING YOUR BODY WITH VITAMINS, MINERALS, AND WATER

VITAMINS

Vitamins are promoters of health and wellness. Unlike the carbohydrates, fats, and proteins, the body does not digest vitamins; instead, food products release them and your body tissues absorb them. We classify vitamins as either **fat soluble** or **water soluble**. With the help of fats, the intestinal tract absorbs fat soluble vitamins (A, D, E, and K) and stores them in the body. The water in the tissues dissolves the water soluble vitamins (B complex and C).

Many countries have standards for vitamin and mineral requirements to recommend daily amounts needed for good health. For example, the standards for the United States are the Referenced Daily Intakes (RDI). From time to time, the federal government reviews these standards and proposes new ones as research continues and more complete information about vitamins and minerals is discovered. Shown on the following pages are the U.S. RDI for vitamins and minerals.

VITAMINS			
VITAMIN	U.S. RDI	FUNCTIONS	SOURCES
A	5000 International Units (IU)	Helps maintain eyes, skin, and linings of the nose, mouth, digestive, and urinary tracts	Liver, dairy products, fortified margarine, orange fruits and vegetables, dark-green vegetables
B-1 (Thiamin)	1.5 mg	Helps convert carbohydrates into energy	Yeast, rice, whole-grain and enriched breads/cereals, liver, pork, meat, poultry, eggs, fish, fruits, vegetables
B-2 (Riboflavin)	1.7 mg	Helps convert nutrients into energy; helps maintain skin, mucous membranes, and nervous structures	Dairy products, liver, yeast, fruits, whole-grain and enriched breads/cereals, vegetables, meat, poultry
B-3 (Niacin)	20 mg	Helps convert nutrients into energy; essential for growth; aids in synthesis of hormones	Liver, poultry, fish, milk, eggs, whole-grain and enriched breads/cereals, fruit, vegetables
B-5 (Pantothenic Acid)	10 mg	Helps convert nutrients into energy	Liver, yeast, whole grains, eggs, beans, milk
B-6 (Pyridoxine)	2.0 mg	Aids in more than 60 enzyme reactions	Milk, liver, meat, green, leafy vegetables, whole-grain and enriched breads/cereals
B-7 (Biotin)	0.3 mg	Helps convert nutrients to energy	Liver, yeast, milk, oatmeal, beans, nuts, egg yolk
B-9 (Folic Acid)	0.4 mg	Aids in blood cell production; helps maintain nervous system	Liver, green, leafy vegetables, beans
B-12 (Cobalmin)	6 micrograms (mcg)	Helps form new cells	Meat, seafood, poultry, dairy products, eggs
C	60 mg	Helps maintain and repair connective tissue, bones, teeth, cartilage; promotes wound-healing	Broccoli, brussels sprouts, citrus fruit, tomatoes, potatoes, peppers, cabbage, other fruits and vegetables
D	400 IU	Helps regulate calcium and phosphorus metabolism; promotes calcium absorption; essential for development/maintenance of bones and teeth	Fortified milk, eggs, fish-liver oils, sunlight on skin
E	30 IU	An antioxidant (prevents oxygen from interacting destructively with other substances) that helps protect cell membranes, maintain fats and vitamin A, and increase blood flow	Green, leafy vegetables, whole grains, seeds, nuts, vegetable oil/shortening, liver, egg yolks
K	60 – 80 mcg*	Helps in blood clotting	Green, leafy vegetables, liver, tomatoes, egg yolks, milk

** No U.S. RDI established. Amount is an estimated recommendation for dietary intake.*

POINTS OF INTEREST: VITAMINS

According to a 10-year study of 11,348 U.S. adults, vitamin C was effective at cutting death rates from heart disease and stroke. The study tested three groups getting:

- 50 mg or more a day in food, plus an average supplement of 500 mg
- 50 or more mg and no supplement
- less than 50 mg with no supplement.

Men in Group 1 had a 35% lower mortality rate and 42% lower death rate from heart disease and stroke. Women in Group 1 were 25% less likely to die of heart disease or stroke and had a 10% lower mortality rate.

Taking supplements of 2000 mg of vitamin C daily might be helpful to allergy sufferers.

A new study found vitamin E cuts the risk of certain cancers. Plus, two other studies with 130,000+ people reported vitamin E helps prevent coronary heart diseases.

MINERALS

Minerals are elements found in the environment that help regulate the bodily processes. Without minerals, the body cannot absorb vitamins. Macrominerals are minerals that the body needs in large amounts. These are calcium, phosphorus, magnesium, potassium, sulfur, sodium, and chloride.

MACROMINERALS

MINERAL	U.S. RDI	FUNCTIONS	SOURCES
Calcium	1000 mg	Structure of bones and teeth; muscle contraction; maintenance of cell membranes; blood clotting; nerve impulse transmission; heart activity	Dairy products, small fish (like sardines) with bones, dark-green vegetables, dried beans and peas
Phosphorus	1000 mg	Structure of bones and teeth; release of energy from nutrients; formation of enzymes	Meat, poultry, fish, eggs, dried beans and peas, dairy products
Magnesium	400 mg	Building bones; release of energy from muscle glycogen; conduction of nerve impulse to muscle	Green, leafy vegetables, nuts, soybeans, seeds, whole grains
Potassium	3500 mg*	Muscle contraction; maintenance of fluid and electrolyte balance; transmission of nerve impulse; release of energy from nutrients	Orange juice, bananas, dried fruit, meat, bran, peanut butter, potatoes, coffee, tea, cocoa
Sulfur	140 mg*	Part of sulfur-containing amino acids; firm proteins of hair, nails, and skin	Meat, wheat germ, dried beans and peas, peanuts
Chloride and Sodium	No more than 2400 mg*	Regulate blood and fluids; nerve impulse transmission; heart activity; **metabolic** controls	Table salt (sodium chloride), many canned soups and processed foods, pickles, soy sauce, sauerkraut, celery

** No U.S. RDI established. Amount is an estimated recommendation for dietary intake.*

Although sodium is a macromineral, many Americans consume too much of it, which can contribute to high blood pressure. High blood pressure, in turn, can contribute to cardiovascular disease. On the other hand, many Americans do not consume enough calcium, and a calcium deficiency can lead to osteoporosis later in life.

Although the body only needs trace minerals (such as selenium, manganese, molybdenum, iron, copper, zinc, iodine, and chromium) in very small amounts, they are also essential for proper functioning of the body. For example, an iron deficiency can reduce the number and size of red blood cells, causing weakness, sleepiness, and headaches.

TRACE MINERALS

MINERAL	U.S. RDI	FUNCTIONS	SOURCES
Selenium	50 – 75 mcg*	Prevents breakdown of fats	Seafood, whole-grain cereals, meat, egg yolk, milk, garlic
Manganese	5 mg*	Central nervous system; normal bone structure; reproduction	Nuts, whole grains, vegetables, fruits, tea, cocoa powder
Fluoride	1.5 to 4 mg*	Tooth and bone formation	Drinking water in some places, seafood, tea
Molybdenum	75 – 250 mcg*	Part of enzymes	Legumes, cereals, liver, kidneys, dark-green vegetables
Iron	18 mg	Formation of hemoglobin; part of enzymes and proteins	Liver, kidneys, meat, egg yolk, green, leafy vegetables, dried fruit, dried beans and peas, whole-grain and enriched cereals
Copper	2 mg	Formation of red blood cells; part of respiratory enzymes	Oysters, nuts, cocoa powder, liver, kidneys, beans, corn oil, margarine
Iodine	150 mcg	Functioning of the thyroid gland and production of thyroid hormones	Iodized salt, seafood
Chromium	50 – 200 mcg*	Helps the body use carbohydrates and fats; aids in digestion of protein	Liver, nuts, whole grains, Brewer's yeast, meat, mushrooms, potatoes, apples with skin, oysters
Zinc	15 mg	Part of many enzymes; essential to synthesis of DNA and RNA; metabolizes carbohydrates, fats, and proteins; dispose of carbon dioxide; strengthen immune system; helps wounds heal; helps body use vitamin A	Meat, liver, eggs, poultry, seafood

** No U.S. RDI established. Amount is an estimated recommendation for dietary intake.*

POINT OF INTEREST: MINERALS

A study has found that heart-disease patients who received 150 mcg of chromium per day had a dramatic jump in the HDL cholesterol, the good stuff that helps keep arteries clear.

WATER

About 60 to 70 percent of your body is water, with most of your blood, brain, and muscles being water and even 20 percent of your bones. Water carries the other nutrients, when dissolved, to all parts of the body where and when needed. It also aids in digestion, regulation of temperature, removal of wastes, joint lubrication, and biochemical processes taking place in the body all the time. Without water you would die in a few days. To maintain all the bodily functions water helps carry out, you need to consume the equivalent of six to eight glasses of water a day. If you exercise regularly, you may need as many as ten glasses, especially on the days you exercise.